Equations you need to know !!!

Section 1

|  |  |
| --- | --- |
| Diffusion of gases: formation of ammonium chloride from ammonia and hydrogen chloride gas | HCl (g) + NH3 (g) ⎯→ NH4Cl (s) |
| Electrolysis of molten lead bromide | PbBr 2 (l) ⎯→ Pb (s) + Br2 (l) |
| Electrolysis of concentrated sodium chloride solution (=brine) | 2H+(aq) + 2Cl- (aq) ⎯→ Cl2 (g) + H2 (g) |
| Electrolysis of dilute sulphuric acid | 4OH- (aq) + 4H+ (aq) → O2 (g) + 2H2O (l) + 2H2 (g) |

Section 2

|  |  |
| --- | --- |
| Alkali metals in water | 2Na (s) + 2H2O (g) ⎯→ 2NaOH (aq) + H2 (g)  You can replace Na in the equation above with Li, K, Rb or even Cs. |
| Displacement of chloride ions by fluorine | F2 (aq) + 2NaCl (aq) → Cl2 (aq) + 2NaF (aq)  You can replace Cl by Br or I (iodine). |
| Displacement of bromide ions by chlorine | Cl2 (aq) + 2NaBr (aq) → Br2 (aq) + 2NaCl (aq)  You can replace Br by I (iodine). |
| Displacement of iodide ions by bromine | Br2 (aq) + 2NaI (aq) → I2 (aq) + 2NaBr(aq) |
| Oxidation of copper | 2Cu (s) + O2 (g) ⎯→ 2CuO (s) |
| Laboratory preparation of oxygen using hydrogen peroxide and manganese dioxide as catalyst | 2H2O2 (l) → 2H2O (l) + O2 (g) |
| Burning of magnesium | 2Mg (s) + O2 (g) → 2MgO (s) |
| Burning of carbon | C (s) + O2 (g) → CO2 (s) |
| Oxidation of sulphur | S (s) + O2 (g) → SO2 (g) |
| Preparation of carbon dioxide using an acid and a metal carbonate | CaCO3 (s) + 2HCl (aq) → CaCl2 (aq) + 2H2O (l) + CO2 (g) |
| Combustion of hydrogen | 2H2 (g) + O2 (g) → 2H2O(l) |
| Testing for water/hydration of anhydrous copper sulphate | CuSO4 (s) + 5 H2O (l) → CuSO4.5H2O |
| Magnesium and hydrochloric acid to produce hydrogen | Mg (s) + 2HCl (aq) → MgCl2 (aq) + H2 (g)  Replace hydrogen by any other group 2 metal or Cu or Zn |
| Some displacement reactions involving metals and metal salt solutions | Mg (s) + CuSO4 (aq) → MgSO4 (aq) + Cu (s)  Fe (s) + CuSO4 (aq) → FeSO4 (aq) + Cu (s) |
| Testing for sulphate ion to form a white precipitate (s) (this is also an equation for the preparation of an insoluble salt) | CuSO4 (aq) + Ba(NO3)2 (aq) → Cu(NO3 )2 (aq) + BaSO4 (s) |
| Testing for chloride ion to form a white precipitate (s) (this is also an equation for the preparation of an insoluble salt) | CuCl2 (aq) + 2AgNO3 (aq) → Cu(NO3 )2 (aq) + 2AgCl (s) |
| Thermal decomposition of a metal carbonate | CuCO3 (s) → CuO (s) + CO2 (g) |
|  |  |

Section 3

|  |  |
| --- | --- |
| Complete combustion of methane | CH4 + 2O2 ⎯→ CO2 + 2H2O |
| Incomplete combustion of methane | 2CH4 + 3O2 ⎯→ 2CO + 4H2O |
| Methane reacting with chlorine in UV (substitution) | CH4 + Cl2 ⎯→ CH3Cl + HCl |
| Ethene reacting with bromine (=addition) | C2H4 + Br2 ⎯→ C2H4Br2 |
| Hydration of ethane to form ethanol | C2H4 + H2O ⎯→ C2H5OH |
| Fermentation | C6H12O6 (aq) ⎯→ 2C2H5OH (aq) + 2CO2 (g) |

Section 4

|  |  |
| --- | --- |
| Acid reacting with a metal to form hydrogen and a salt | H2SO4 (aq) + Mg (s) ⎯→ MgSO4 (aq) + H2 (g)  Mg can be replaced by Zn, Cu or a group 2 metal |
| Acid reacting with a metal oxide to produce a salt and water | 2HCl (aq) + MgO (s) ⎯→ MgCl2 (aq) + H2O (l) |
| Acid reacting with a metal hydroxide to form a salt and water | HCl (aq) + NaOH (aq) ⎯→ NaCl (aq) + H2O (l) |
| Acid reacting with a metal carbonate to form a salt, water and carbon dioxide | 2HCl (aq) + CaCO3 (s) ⎯→ CaCl2 (aq) + H2O (l) + CO2 (g) |
| Dissociation of hydrogen chloride in water | HCl (aq) → H+ (aq) + Cl- (aq) |
| Forming an insoluble salt e.g. lead chloride | CuCl2 (aq) + Pb(NO3)2 (aq) → Cu(NO3 )2 (aq) + PbCl2 (s) |
| Reversible reaction dehydration and hydration of copper sulphate | CuSO4.5H2O (s) ⇔ CuSO4 (s) + 5H2O (l) |
| Ammonium chloride reversible reaction | NH4Cl (s) ⇔ HCl (g) + NH3 (g) |

Section 5

|  |  |
| --- | --- |
| Carbon burning to make carbon dioxide; this is important because it provides the heat for the reduction. | C (s) + O2 (g) ⎯→ CO2 (g) |
| Carbon dioxide reacting with carbon (at the top of the furnace there is little oxygen) to form carbon monoxide | C (s) + CO2 (g) ⎯→ 2CO (g) |
| **Carbon monoxide reduces the iron oxide (this is the main reaction)** | Fe2O3 (s) + 3CO (g)⎯→ 2Fe (s) + 3CO2 (g) |
| Calcium carbonate decomposing | CaCO3 (s) ⎯→ CaO(s) + CO2 (g) (waste gas) |
| Calcium oxide reacting with silicon dioxide to form slag | CaO (s) + SiO2 (s) ⎯→ CaSiO3 (s) |
| Electrolysis of molten aluminium oxide | 2Al2O3 ⎯→ 4Al (s) + 3O2 (g) |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |